UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

A SUMMARY OF U.S. GEOLOGICAL SURVEY MARINE GEOLOGIC STUDIES ON THE INNER SHELF OF THE CHUKCHI SEA, ALASKA, SUMMER, 1982

By

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Open-File Report

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The 42 foot U.S.G.S. research vessel KARLUK conducted reconnaissance geologic surveys of the inner shelf of the Chukchi Sea, Alaska, during the summer of 1982. The areas covered by these surveys include parts of lease sale 85, Barrow Arch, 86, Hope Basin, and 87, the Diapir Field (Figure 1). In addition to the nearshore investigations using the R/V KARLUK, the U.S.G.S. has conducted surveys of the outer Chukchi Sea shelf using larger vessels (Grantz and others, 1982). The areas covered by those larger vessels slightly overlap the areas surveyed by the KARLUK. In this report we outline the scope of our field efforts in the Chukchi Sea, describe the equipment used, and give information on the location and availability of the data.

FIELD OPERATIONS

The field operations were divided into two three-week cruises (cruise I.D. numbers K1-82-AR and K2-82-AR, respectively). Each cruise, headed by a different chief scientist, covered distinct areas of coastline. The first cruise, K1-82-AR, headed by Ralph Hunter, covered areas east of Cape Prince of Wales and south of Point Hope, including Kotzebue Sound. The second cruise, (K2-82-AR), headed by Larry Phillips, covered parts of the inner shelf north of Icy Cape to Point Barrow. The primary goal of these cruises was to determine, at a reconnaissance level, the geologic character and processes acting on the seafloor on the inner shelf. These cruises were similar in nature (and survey areas) to those conducted in 1975 and 1981 by the R/V KARLUK (Reiss and others, 1983).

DATA ACQUIRED

We obtained geophysical data along 684 km of trackline, took 54 sediment grab samples, and made hydrographic measurements of the ocean water in one location. Trackline and sample locations for K1-82-AR are shown in Figures 2-6 and those for K2-82-AR are shown in Figures 7-9. Some areas of coastline were surveyed in great detail while others were targets of opportunities that were dependent on time and weather conditions. Geophysical data were acquired on 23 days out of a possible 40 days of combined field time. Strong winds and high waves on some days hampered field operations and resulted in some poor quality records. Ice conditions limited operations only in the area north of Point Barrow. Geophysical data and samples were obtained within the bays and lagoons at times when weather conditions did not permit work on the open shelf.

Data acquired consist of 684 km of trackline bathymetry, 664 km of side-scan sonar records, and 509 km of uniboom seismic reflection records. Fifty seafloor grab samples and four beach samples were taken. The data are in the form of 10 rolls of Raytheon fathometer recordings, 16 rolls of Simrad fathometer recordings, 16 rolls of wet paper side-scan sonar recordings, 12 rolls of uniboom recordings, 22 field maps, and two ship's logs. The field maps show trackline and sample locations and the ship's log contains important information on systems in use on each line, system settings (scale, filters,etc.), navigational data used in plotting ship's position, sea-state and weather conditions, course-holding problems, and unique observations or system difficulties.

EQUIPMENT

Bathymetry was recorded on a Raytheon RTT 1000 dry paper recorder using hull mounted 200-kHz and 7-kHz transducers with an eight-degree beam width. To obtain greater bathymetric resolution, a towed 200-kHz transducer with a 4-degree beam width (narrow beam) was occasionally used. A Simrad 607 dry-paper recorder using a hull mounted 3.8-kHz transducer was also used for depth determinations and for general piloting of the vessel. All records were corrected for the draft of the vessel or tow depth. High-resolution seismic data were obtained using a 300-Joule EG&G Model 234 uniboom sound source, firing at 1/4 second intervals. The signals were received by either a three- or eleven- element hydrophone and recorded on an EPC Model 1400 recorder using 1/4 second sweep speed. The signal was filtered to approximately 400-1200 kHz. Side-scan sonar records were taken using a Model 259-3 EG&G wet-paper system employing a Model 272 sonar fish with a 105-kHz, 1/10 second pulse at a 20-degree beam angle depression.

Navigational control was based primarily on radar and satellite navigation systems. In some locations, a Del Norte trisponder system was used along with the forementioned systems. The probable uncertainty in ship's position was dependent on the navigation system in use. With the Del Norte system, precise navigation fixes to within ten meters were obtained. Satellite fixes had a precision of 200 meters to as much as 2000 meters depending on satellite pass frequency and the reliability of the ship's projected course (D.R.) between each satellite pass. The precision of radar positions was within tens of meters when ranged on good land contacts and hundreds of meters for distant ranges and poor land contacts.

Copies of the data are available on microfilm through the National Geophysical Data Center, NOAA/EDIS/NGDC, Code D64, 325 Broadway, Boulder, CO. 80303. Telephone: (303) 497-6338. The microfilm contains copies of the geophysical records, the ship's logs and a computer print-out of digitized way points. The print-out of these points would allow for reproduction of the ship's tracklines at any scale and projection. The tracklines can be correlated with the geophysical records through time points. Original records are archived at the U.S.Geological Survey, Deer Creek Facility, 3475 Deer Creek Road, Palo Alto, Ca. 94304.

The data obtained on these cruises are currently being studied by the authors as part of a study of the nearshore Chukchi Sea. Interpretations of data from previous cruises in the field area are available in publications by Barnes and others (1981, 1982, 1983).

ACKNOWLEDGMENT

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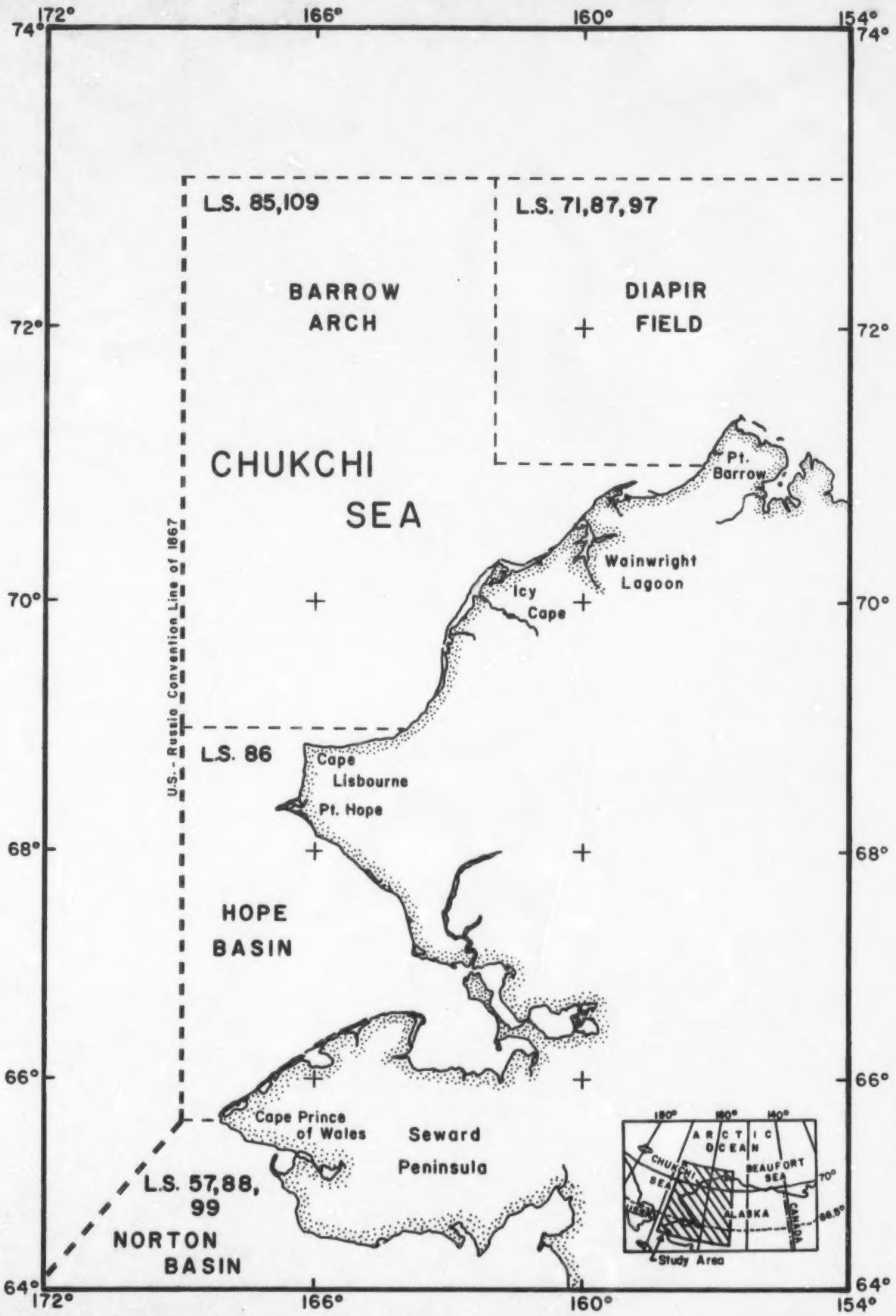

Figure 1: Proposed lease sale areas off north-western Alaska, (as of 3/1/82).

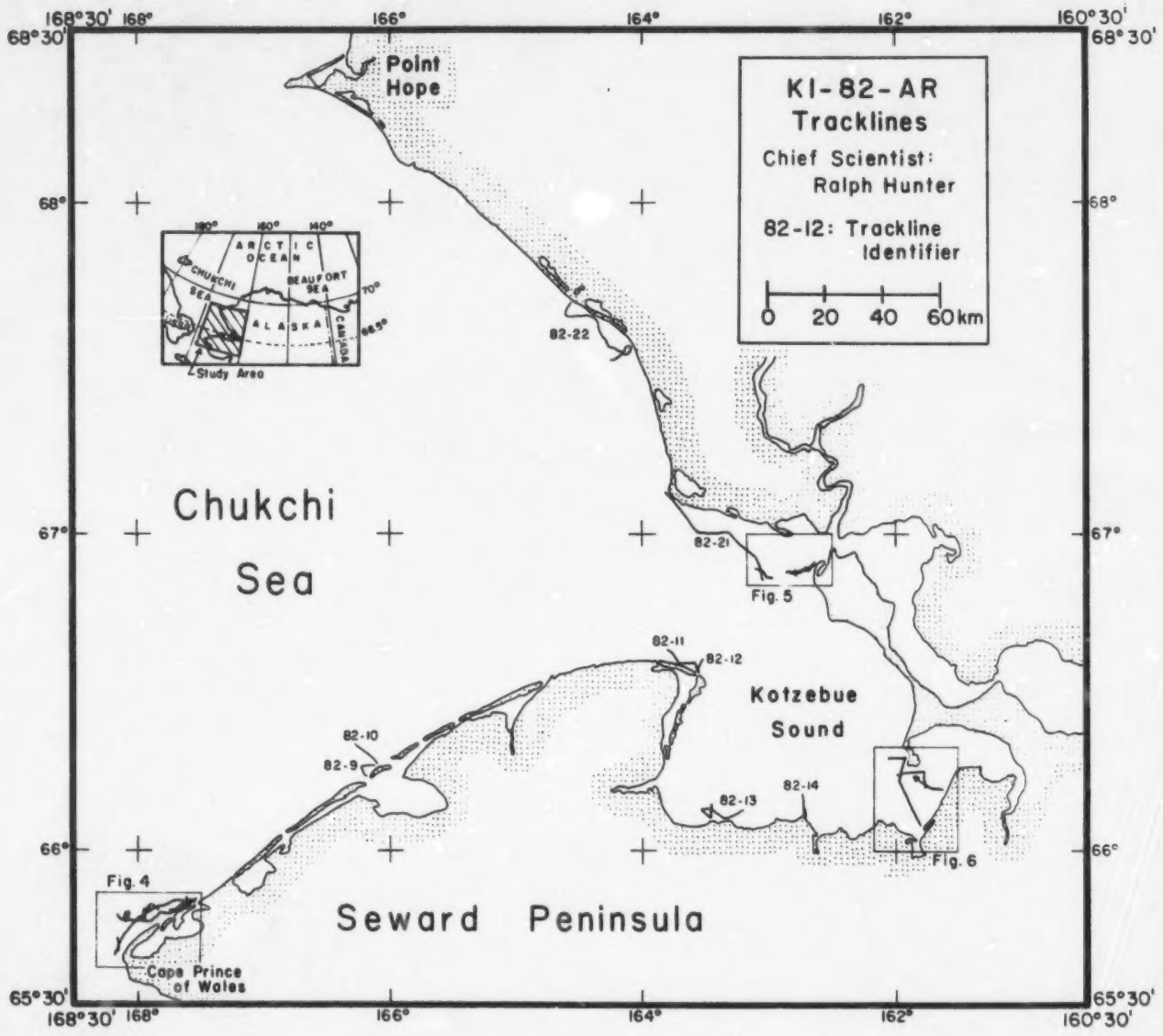

Figure 2: Figure location and trackline distribution diagram from Cape Prince of Wales to Point Hope for K1-82-AR.

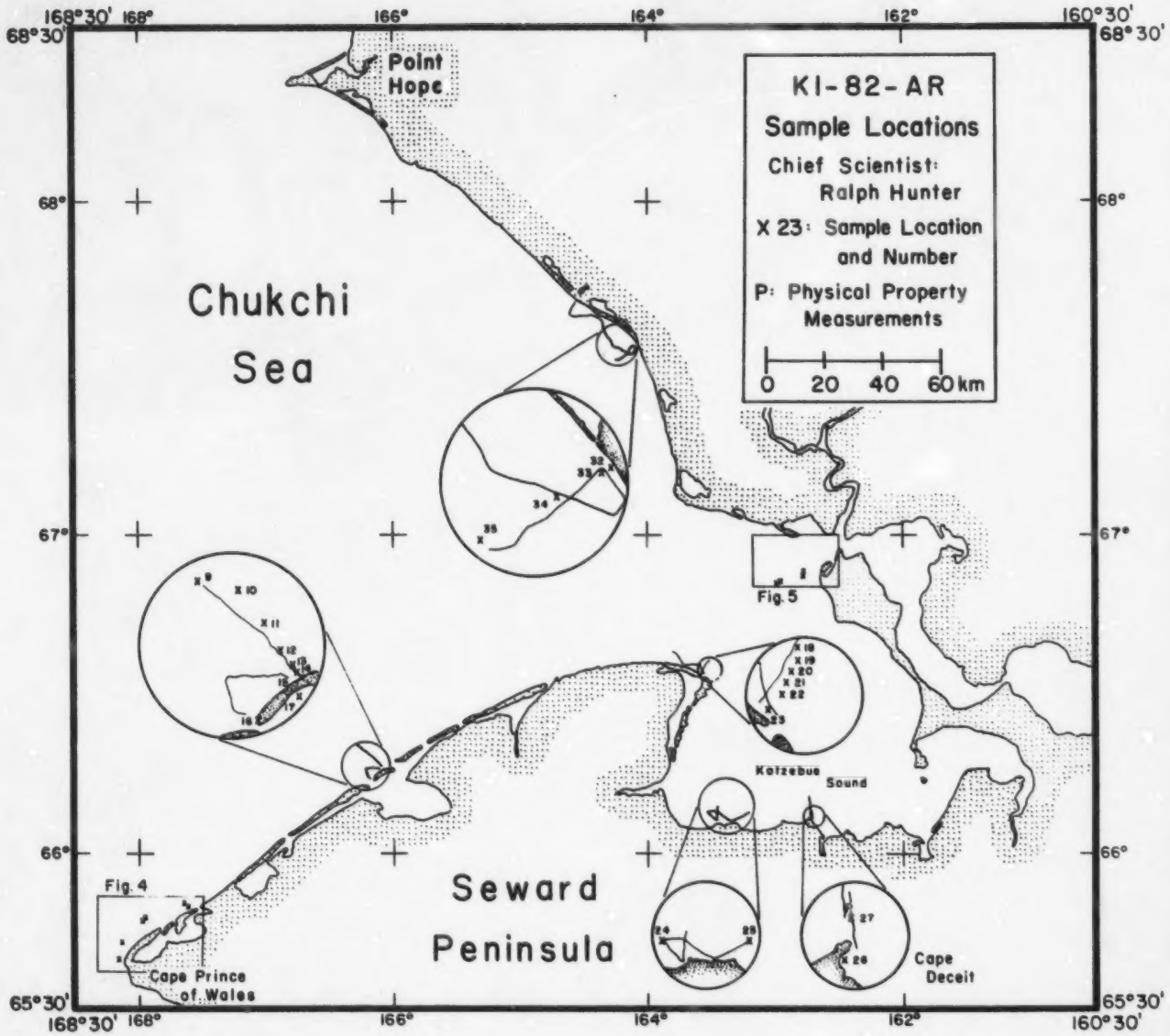

Figure 3: Figure location and sample distribution diagram from Cape Prince of Wales to Point Hope for K1-82-AR.

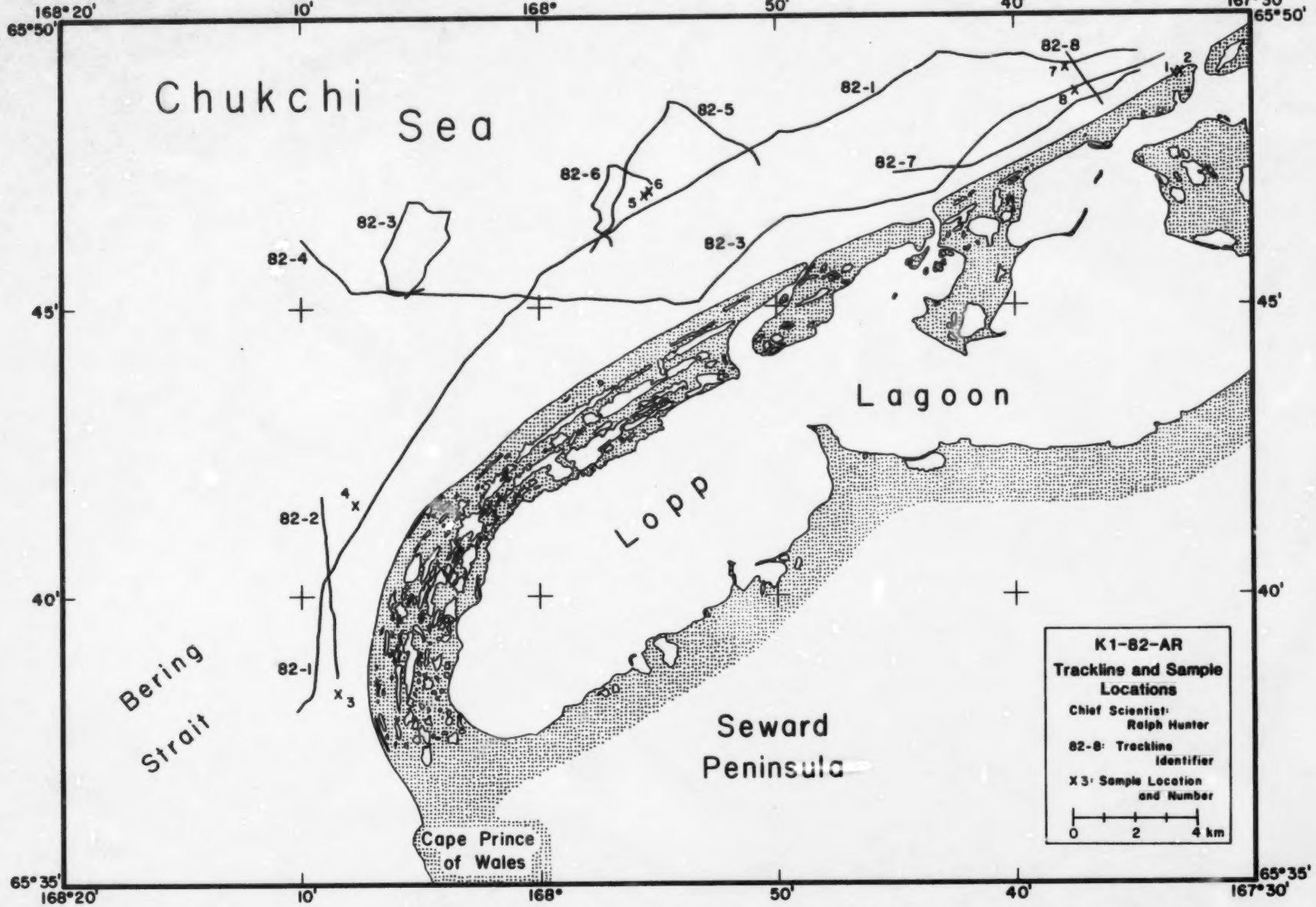

Figure 4: Trackline and sample locations from Cape Prince of Wales area for K1-82-AR.

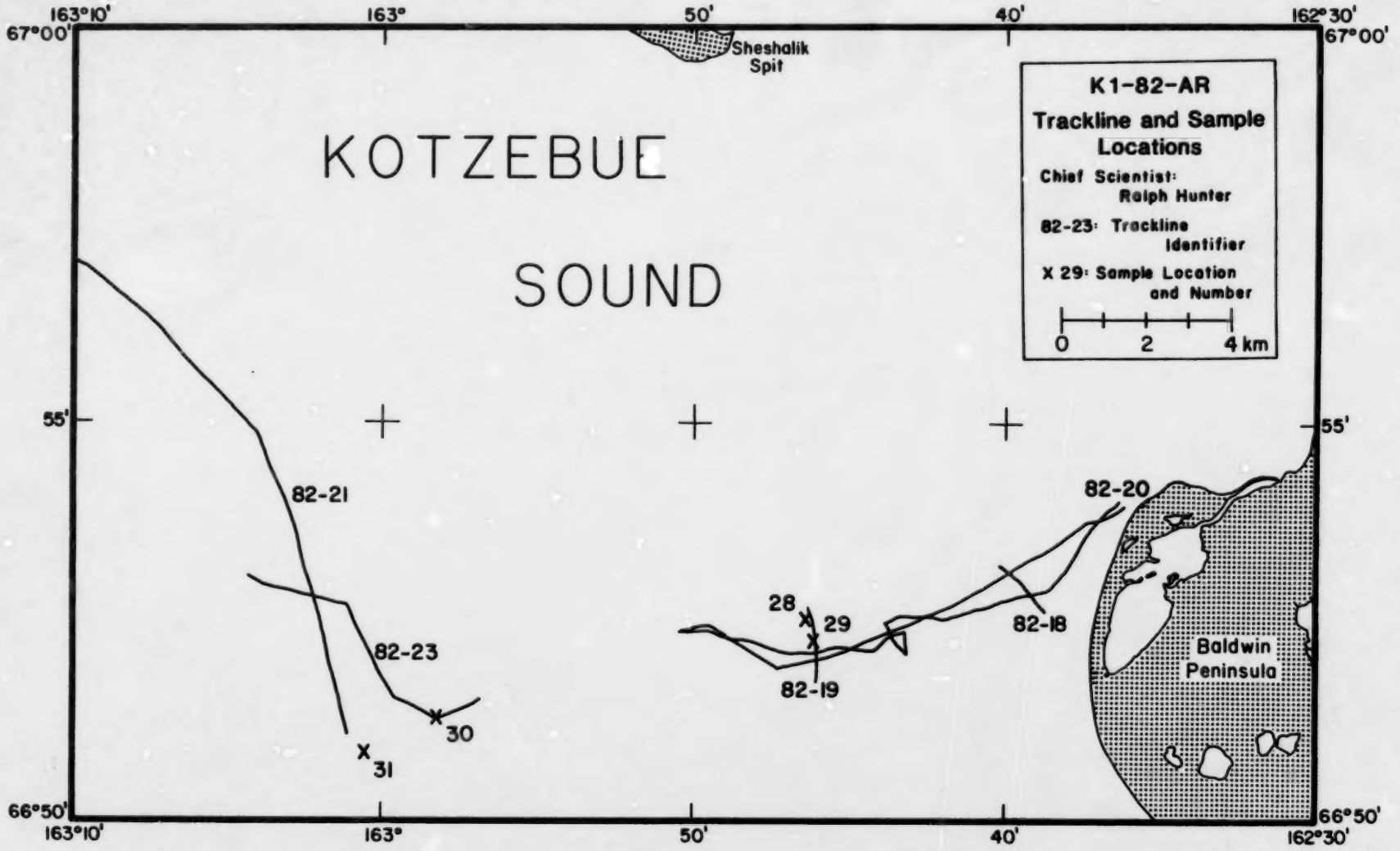

Figure 5: Trackline and sample locations from the Baldwin Peninsula area, Kotzebue Sound, for K1-82-AR.

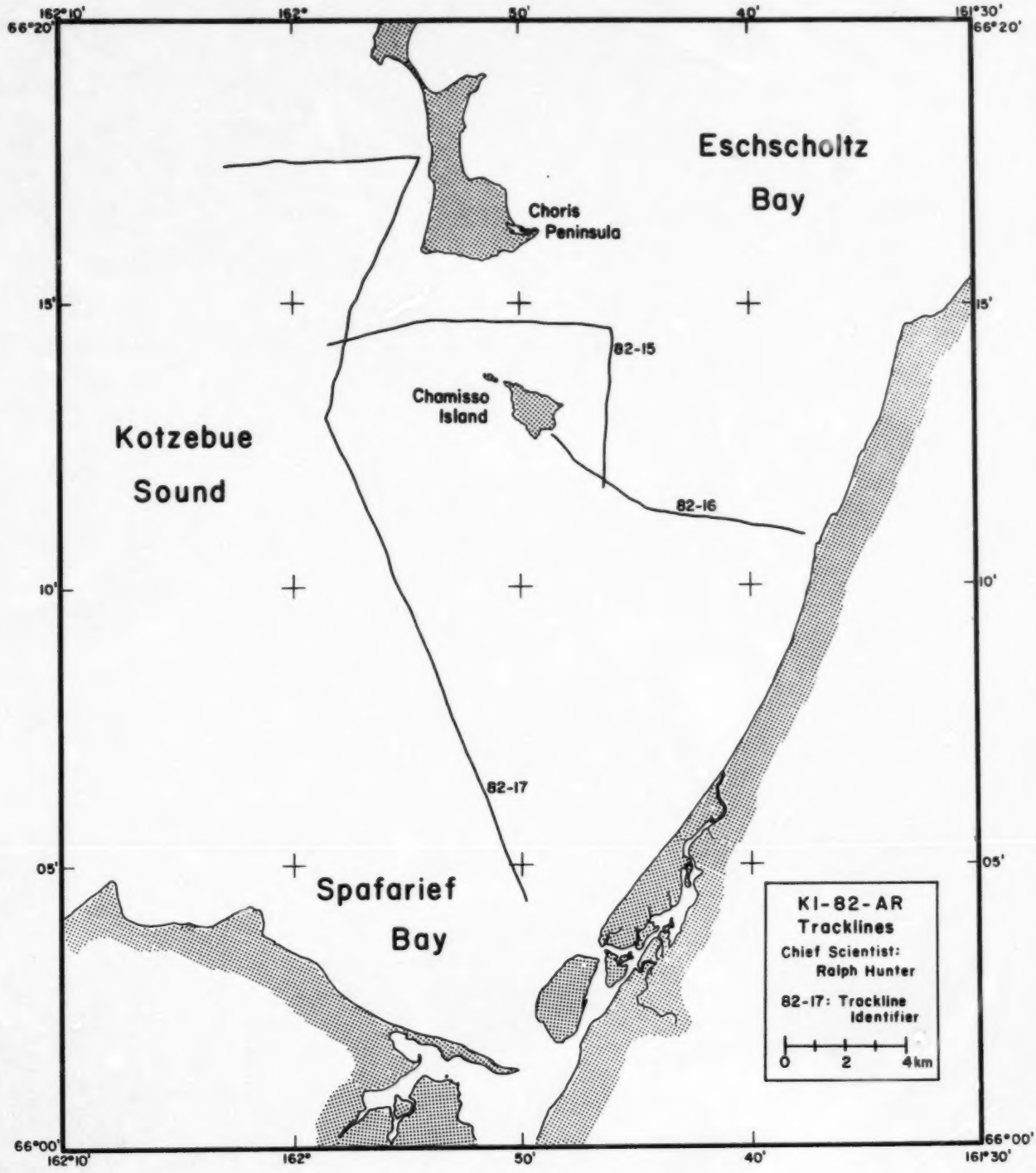

Figure 6: Trackline locations from south-west Kotzebue Sound for KI-82-AR.

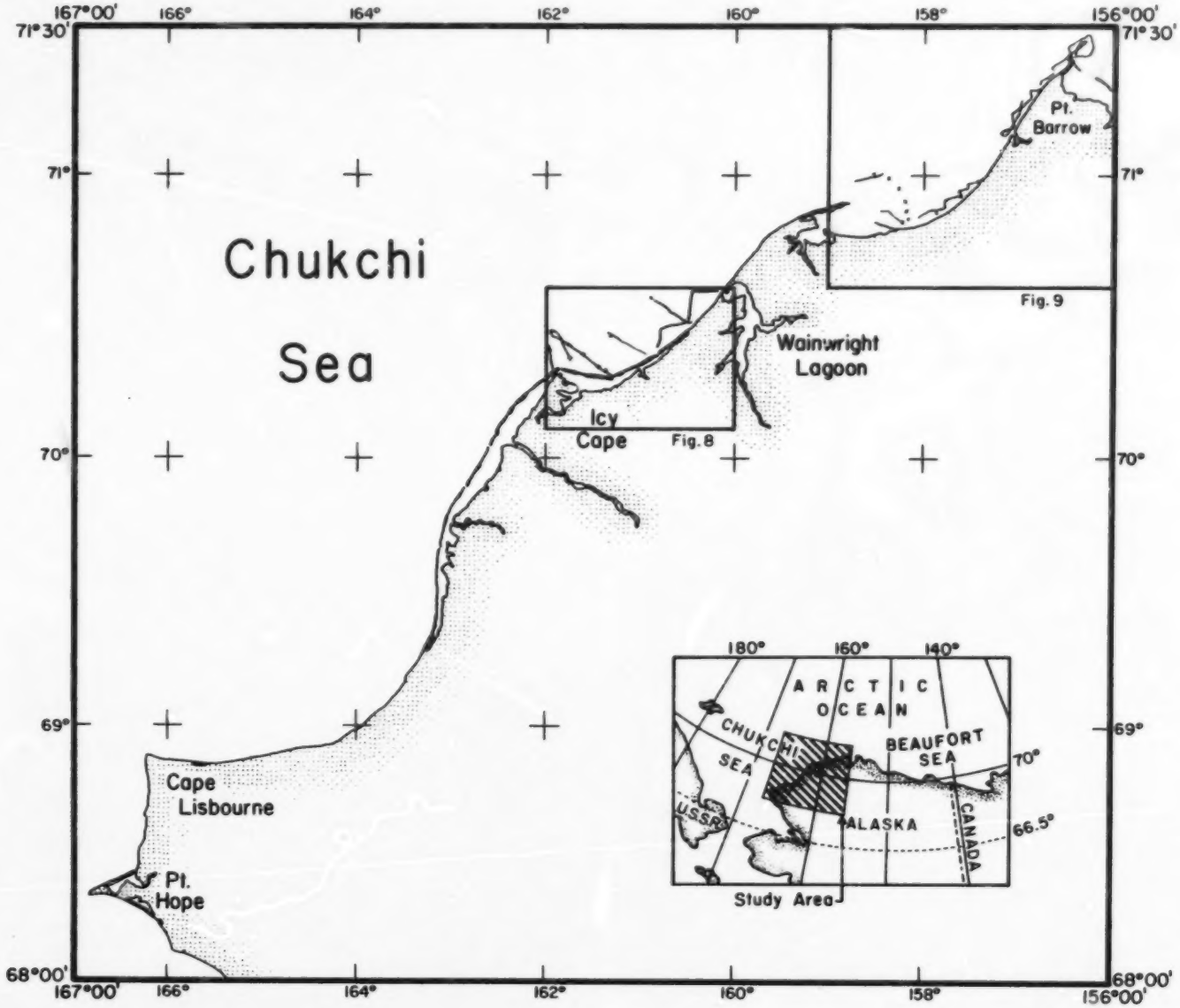

Figure 7: Figure location diagram of trackline and sample locations from Point Hope to Point Barrow for K2-82-AR.

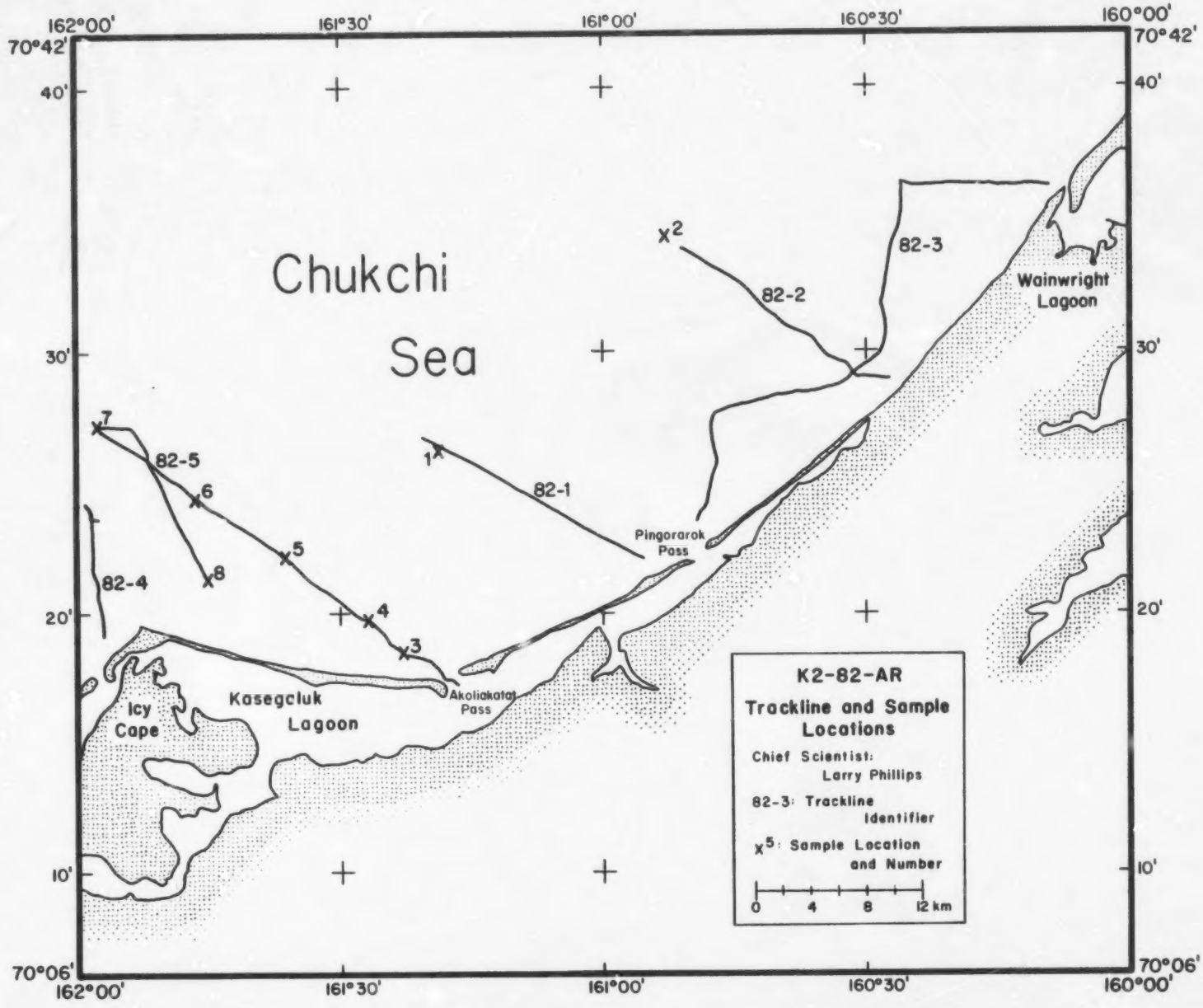

Figure 8: Trackline and sample locations from Icy Cape to Wainwright Lagoon for K2-82-AR.

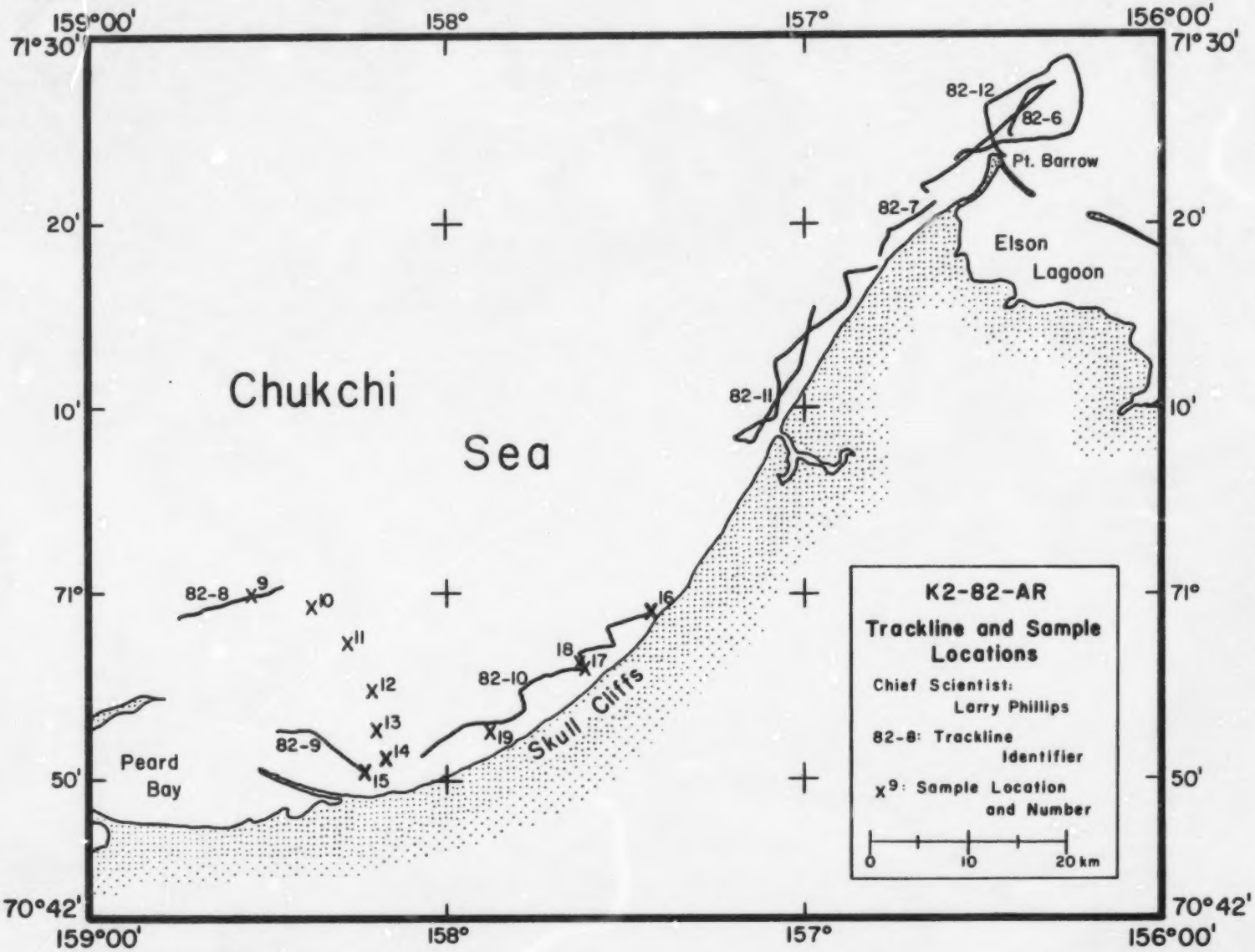

Figure 9: Trackline and sample locations from Peard Bay to Point Barrow for K2-82-AR.